WHAT IS CLAIMED IS:

1. A wireless communication receiver comprising:

an antenna array which comprises plural antennas, the plural antennas providing respective plural signals indicative of an arriving wavefront;

a joint searcher and channel estimator which essentially concurrently considers the plural signals provided by the plural antennas for determining both a time of arrival and channel coefficient.

2. The apparatus of claim 1, wherein the joint searcher and channel estimator essentially concurrently considers the plural signals provided by the plural antennas for determining plural times of arrival and plural channel coefficients, an arriving wavefront being represented by one of the plural times of arrival and a corresponding one of the plural channel coefficients.

3. The apparatus of claim 1, wherein the time of arrival and the channel coefficient are essentially concurrently determined by the joint searcher and channel estimator.

4. The apparatus of claim 3, wherein the time channel coefficient is a composite channel coefficient which takes into consideration channel impulse responses for channels associated with each of the plural antennas in the antenna array.

5. The apparatus of claim 1, further comprising a detector which utilizes the channel coefficient and the time of arrival to provide a symbol estimate.

6. The apparatus of claim 1, wherein the wireless communication receiver is a mobile terminal.

7. The apparatus of claim 1, wherein the wireless communication receiver is a network node.

8. The apparatus of claim 1, wherein the antenna array comprises a uniform linear array of plural antennas.

9. The apparatus of claim 1, wherein each of the plural antennas in the antenna array is represented by an antenna index, and wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which a complex value indicative of the signal received in a sampling window is stored as a function of a sampling window time index and the antenna index;

a matrix analyzer matched in a spatial domain to a direction of arrival, the matrix analyzer generating matrix analyzer output;

an output analyzer which uses the matrix analyzer output to generate the time of arrival and the channel coefficient.

10. The apparatus of claim 1, wherein each of the plural antennas in the antenna array is represented by an antenna index, and wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which a complex value indicative of the signal received in a sampling window is stored as a function of a sampling window time index and the antenna index;

a correlator which performs a Fast Fourier Transformation (FFT) calculation to generate a correlator output;

an correlator output analyzer which uses the correlator output to generate the time of arrival and the channel coefficient.

11. The apparatus of claim 10, wherein in performing the calculation the correlator considers a dimensional receptivity vector formed from the antenna signal matrix with respect to a sampling window time index for the plural antennas of the antenna array, the dimensional receptivity vector having a frequency related to a difference between phase components of complex values of the dimensional receptivity vector, there being plural possible frequencies for the dimensional receptivity, the plural possible frequencies being represented by a frequency index; and

wherein for each combination of plural possible frequencies and plural time indexes, the correlator calculates:

$Y(n,t) = FFT(n,X(:,t))$

wherein t is the sampling window time index;

X(:,t) is the complex antenna matrix, with : representing all antenna indexes for one sampling window time index;

n is the frequency index.

12. The apparatus of claim 11, wherein for each combination of plural possible frequencies and plural time indexes, the correlator calculates:

$Y(n,t) = \Sigma\ C_j * FFT(n,X(:,t)),\ j = 1,K$

wherein C_j is a coding sequence symbol value j and K is a length of the coding sequence.

13. The apparatus of 11, wherein each of the plural possible frequencies for the dimensional receptivity vector represents a different possible direction of arrival of the arriving wavefront.

14. The apparatus of 11, wherein the correlator output comprises Y(n,t), and wherein the correlator output analyzer determines a maximum absolute value $|Y(n,t)|_{max}$, wherein the analyzer uses a sampling window time index t_max at which $|Y(n,t)|_{max}$ occurs as the time of arrival of the arriving wavefront; and wherein the analyzer uses the a frequency index n_max at which $|Y(n,t)|_{max}$ occurs as the direction of arrival of the arriving wavefront.

15. The apparatus of 14, wherein the correlator output comprises Y(n,t), and wherein for each arriving wavefront the correlator output analyzer determines a qualifying absolute value $|Y(n,t)|_{max}$, wherein the analyzer uses a sampling window time index t_max at which $|Y(n,t)|_{max}$ occurs as the time of arrival of the arriving wavefront; and wherein the analyzer uses the a frequency index n_max at which $|Y(n,t)|_{max}$ occurs as the direction of arrival of the arriving wavefront.

16. The apparatus of 11, wherein the correlator output comprises Y(n,t), and wherein the analyzer determines a maximum absolute value $|Y(n,t)|_{max}$, wherein the analyzer obtains an amplitude for the arriving wavefront by dividing $|Y(n,t)|_{max}$ by a number of antennas comprising the antenna array.

17. The apparatus of claim 1, wherein each of the plural antennas in the array is represented by an antenna index, and wherein the joint searcher and channel estimator comprises:

an antenna signal matrix in which a complex value indicative of the signal received in a sampling window is stored as a function of a sampling window time index and the antenna index;

a parametric estimator which uses complex values in the antenna matrix to generate a parametric estimation output vector;

an analyzer which uses the parametric output estimation vector to generate the time of arrival and the channel coefficient.

18. The apparatus of claim 17, wherein each parameter in each time index corresponds to a possible direction of arrival.

19. The apparatus of claim 17, wherein the analyzer uses absolute values of elements of the parametric output estimation vector to determine the time of arrival and direction of arrival of the arriving wavefront.

20. The apparatus of claim 19, wherein the parametric output estimation vector has a sampling window time index and wherein for an element of the parametric output estimation vector having a sufficiently high absolute value the analyzer uses a sampling window time index for an element of the parametric output estimation vector having a sufficiently high absolute value to determine the time of arrival of the arriving wavefront.

21. A method of operating a wireless communication receiver comprising:

obtaining from plural antennas of an antenna array respective plural signals indicative of an arriving wavefront;

concurrently using the plural signals provided by the plural antennas for determining both a time of arrival and channel coefficient.

22. The method of claim 21, further comprising concurrently using the plural signals provided by the plural antennas for determining plural times of arrival and plural channel coefficients for respective plural arriving wavefronts, each of the plural

arriving wavefront being represented by one of the plural times of arrival and a corresponding one of the plural channel coefficients.

23. The method of claim 21, further comprising essentially concurrently determining the time of arrival and the channel coefficient.

24. The method of claim 23, wherein the time channel coefficient is a composite channel coefficient which takes into consideration channel impulse responses for channels associated with each of the plural antennas in the antenna array.

25. The method of claim 21, further comprising applying the channel coefficient and the time of arrival to a detector to obtain a symbol estimate.

26. The method of claim 21, wherein the step of concurrently using the plural signals provided by the plural antennas for determining both a time of arrival and channel coefficient is performed by a joint searcher and channel estimator situated in a mobile terminal.

27. The method of claim 21, wherein the step of concurrently using the plural signals provided by the plural antennas for determining both a time of arrival and channel coefficient is performed by a joint searcher and channel estimator situated at a network node.

28. The method of claim 21, further comprising associating each of the plural antennas in the antenna array with an antenna index, and wherein the step of concurrently using the plural signals provided by the plural antennas for determining both a time of arrival and channel coefficient is performed by a joint searcher and channel estimator; and further comprising the steps of the joint searcher and channel estimator:

storing a complex value indicative of the signal received in a sampling window in an antenna signal matrix as a function of a sampling window time index and the antenna index;

performing a Fast Fourier Transformation (FFT) calculation to generate a correlator output;

using the correlator output to generate the time of arrival and the channel coefficient.

29. The method of claim 28, wherein in performing the FFT calculation the joint searcher and channel estimator considers a dimensional receptivity vector formed from the antenna signal matrix with respect to a sampling window time index for the plural antennas of the antenna array, the dimensional receptivity vector having a frequency related to a difference between phase components of complex values of the dimensional receptivity vector, there being plural possible frequencies for the dimensional receptivity, the plural possible frequencies being represented by a frequency index; and wherein the method further includes:

for each combination of plural possible frequencies and plural time indexes, evaluating the following expression:

$Y(n,t) = FFT(n,X(:,t))$

wherein t is the sampling window time index;

$X(:,t)$ is the complex antenna matrix, with : representing all antenna indexes for one sampling window time index;

n is the frequency index.

30. The method of 29, wherein for each combination of plural possible frequencies and plural time indexes, the method comprises evaluating the following expression:

$Y(n,t) = \Sigma\ C_j * FFT(n,X(:,t)),\ j = 1,K$

wherein C_j is a coding sequence symbol value j and K is a length of the coding sequence.

31. The method of 28, wherein each of the plural possible frequencies for the dimensional receptivity vector represents a different possible direction of arrival of the arriving wavefront.

32. The method of 28, wherein the correlator output comprises $Y(n,t)$, and further comprising determining a maximum absolute value $|Y(n,t)|_{max}$.

33. The method of 32, further comprising:

selecting a sampling window time index t_max at which $|Y(n,t)|_{max}$ occurs as the time of arrival of the arriving wavefront; and

selecting a frequency index n_max at which $|Y(n,t)|_{max}$ occurs as the direction of arrival of the arriving wavefront.

34. The method of 32, further comprising determining an amplitude for the arriving wavefront by dividing $|Y(n,t)|_{max}$ by a number of antennas comprising the antenna array.

35. The method of claim 21, wherein each of the plural antennas in the array is represented by an antenna index, and wherein the method further comprises:

storing, in an antenna signal matrix, a complex value indicative of the signal received in a sampling window as a function of a sampling window time index and the antenna index;

forming a parametric estimate using complex values in the antenna matrix and generating a parametric output estimation vector;

using the parametric output estimation vector to generate the time of arrival and the channel coefficient.

36. The method of claim 35, wherein each frequency parameter in the parameter estimation vector corresponds to a possible direction of arrival.

37. The method of claim 35, further comprising using absolute values of elements of the parametric output estimation vector to determine the time of arrival and direction of arrival of the arriving wavefront.

38. The method of claim 37, wherein the parametric output estimation vector has a sampling window time index and wherein for an element of the parametric output estimation vector having a sufficiently high absolute value, the method further comprises using a sampling window time index for an element of the parametric output estimation vector having a sufficiently high absolute value to determine the time of arrival of the arriving wavefront.